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Editor: J. F. Silbaugh. Managing Editor: J. R. Deatherage. Contributors to this issue: M. S. Peter, D. R. Klein, E. Evers, J. Davis.

Careers

It was a disappointed job seeker who slipped up behind President Garfield in 1881 and shot him in the back.

This tragedy gave new impetus to the growing public demand for ending the "spoils system"—in those days, the spoilsmen's scramble for jobs customarily put the Government out of business for a month after each change of administration.

Two years later, in 1883, Congress passed the Civil Service Act, which became the foundation of our merit system. The year 1958 marks the 75th anniversary of that act. Under its coverage as gradually extended, about 9 out of 10 Federal workers—more than 2 million of them—are now employed.

Their work touches every American every day. They not only do agricultural research but also deliver our mail, support our fighting forces, help conserve land, regulate immigration, enforce Federal laws, and perform hundreds of other services.

So the merit system, with its basic requirement of open, competitive examinations, is important to every citizen.

To the citizen who wishes to become a Federal worker, the merit system is a guarantee that he may qualify for a job and be considered for promotion on the basis of ability to do the work. He is protected from arbitrary dismissal and from being obliged to render political service or tribute.

To the citizen who is not a Federal employee, the merit system guarantees selection of the best qualified people available for the public service. It requires of our public servants high standards of conduct and competence.

To all citizens, it means a stable Government service.

And never have these considerations been more important than they are today as Americans look to our Government to meet the challenge of the space age. To meet that challenge, the Government must get its share of the available talent.

We must attract young men and women to seek careers in the public service by making them aware of the satisfying opportunities it offers. We must encourage them to follow the example of people like Gold Medal Presidential Award winner Sterling Hendricks (see p. 3). They will join a great company of capable, devoted, and imaginative Americans.

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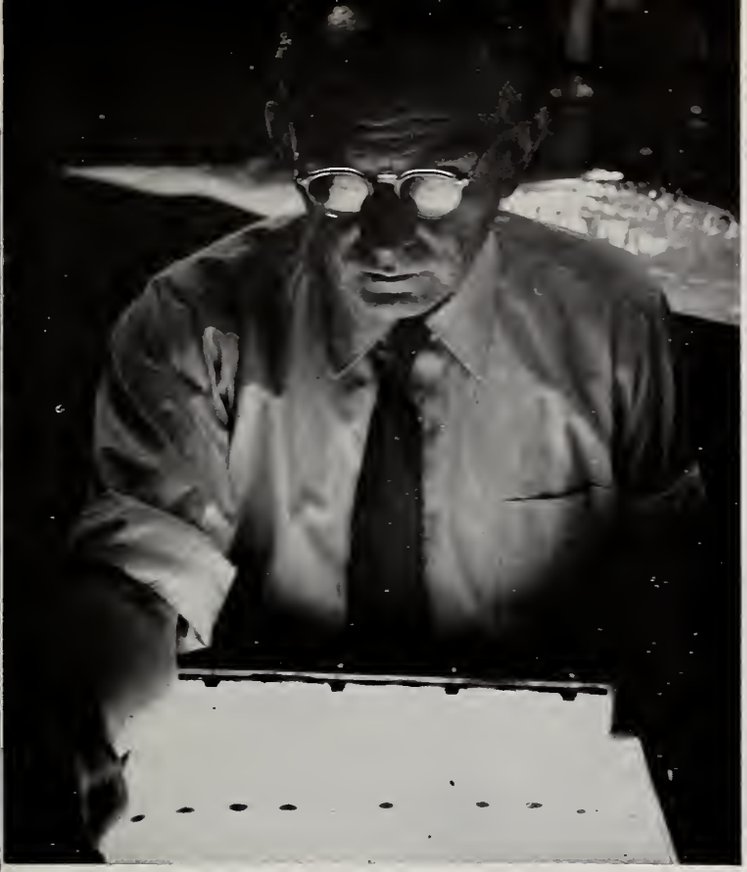

STERLING HENDRICKS studies amount of radiophosphorous on chromatograph negative of barley root extract—illustrating method used to find how plants accumulate inorganic ions.

Meet STERLING HENDRICKS

In the uncharted frontier of basic science he finds adventure, outlet for his curiosity

The first Gold Medal Presidential Award for Distinguished Civilian Service went to USDA's Sterling Hendricks and four others. Cover shows (l–r) President Eisenhower, Hendricks, Secretary Benson.

The President also presented the medals to Loy W. Henderson, Deputy Under Secretary of State for Administration; J. Edgar Hoover, FBI director; Roger W. Jones, assistant director of the Budget Bureau's Legislative Reference Service; and William B. McLean, technical director of the Naval Ordnance Testing Station, China Lake, Calif.

Hendricks was born April 13, 1902, in Elysian Fields, Tex. He was graduated from high school in Shreveport, La., and took his B. Ch. E. degree in chemistry and mathematics in 1922 from the University of Arkansas. He studied geology and chemistry at the University of Iowa, and in 1924, received his M. S. degree in chemistry from the Kansas State Agricultural College. In 1926, he obtained his doctorate from the California Institute of Technology, minoring in mathematical physics and physics.

He is a member of the National Academy of Sciences, a society limited to about 500 members from all sciences. He's holder of USDA's Distinguished Service Award, a fellow of the American Society of Agronomy, and former Fellow of the American Physics Society. He's a trustee of the Plant Physiology Society of America, and former president of the Mineralogical Society of America.

Other honors include the Day Medal, given by the Geological Society of America; an LL. D. degree from the University of Arkansas; the Science Award of the Washington Academy of Sciences; the Hillebrand Prize of the Chemical Society of Washingon.

■ Sterling Brown Hendricks—holder of many awards, leader of USDA's Pioneering Research Laboratory for Mineral Nutrition of Plants, a chemist, physicist, mathematician, plant physiologist, geologist, mineralogist—likes to be known as "just another scientist."

But on January 27, 1958, in a White House ceremony, this mild-mannered man became more than just another scientist. He received one of the first Gold Medal Presidential Awards for Distinguished Civilian Service—highest honor given to career employees.

Hendricks was selected for the honor because of his outstanding discoveries in soil clays, phosphate minerals, radioisotopes applied to agriculture, plant physiology, and fundamental chemistry. To coworkers who were familiar with Hendricks' lifelong disciplined curiosity, the award came as just recognition for many achievements.

He began his 30-year career in USDA in 1928 as an associate chemist at the Fixed Nitrogen Laboratory.

What prompted a young scientist like Hendricks, fresh out of school with degrees in the inanimate fields of chemistry and physics, and with training in mathematics, to seek his future in Government service with the living things of agriculture? What makes such a man leave the comfort and security of his own disciplines to take on the rigors and uncertainties of others?

A deep-seated conviction—or conscience with a social purpose as Hendricks puts it—led him into Federal research. He felt that such service provided the best way to serve the most people. His other self-imposed alternative was teaching. He felt this would be too time consuming, leave too little time for research. So, armed with an array of academic achievements, Sterling Hendricks entered into the service of his Government and has never regretted his decision to engage in research.

Scientists does research in many fields

The many-sided Hendricks—who finds himself at home in a half dozen different fields—says this came about with no conscious purpose. His interest in geology led to study of soils and clays. His interest in soils led to study of plants and how they absorb nutrient from the soil. His interest in the crystalline structure of clays led him to study mineralogy. Thus a man's interests grow.

Much of his early work—from 1930 to 1945—was done on clays. He helped to establish the fact that clay particles are minerals with crystalline structures. This finding enabled scientists to understand the chemical process by which soils make their elements available to plants,

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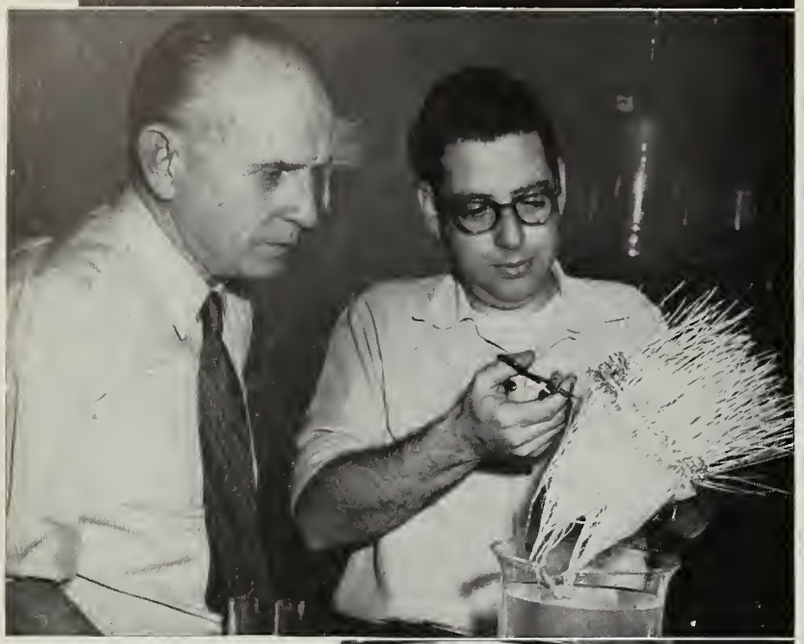


MINERAL UPTAKE in barley roots is talked over by Hendricks (left) and an associate—plant physiologist J. E. Leggett. Both scientists do pioneering work in plant mineral nutrition.

GROWTH RESPONSE of soybeans exposed to different conditions and periods of light are examined by Hendricks. This response—known as photoperiodism—is controlled by a pigment.

and to recognize the important differences in soils that seem to have the same composition.

He developed an important new research technique, X-ray diffraction, to analyze fertilizers, especially phosphate fertilizers. With this method, he revealed the kinds and proportions of compounds in superphosphate and thermally treated phosphate rock. These findings have contributed to the development of present-day methods of manufacturing fertilizers and feed supplements.

Light, minerals are main interests now

More recently, Hendricks and ARS plant physiologist H. A. Borthwick have worked on photoperiodism—the response of plants to light intensities. These two scientists have already found that this phenomena is controlled by the action of a plant pigment. This finding has far-reaching implications, and helps to explain some of the mysteries of plant growth, flowering, and seed germination. Hendricks and Borthwick are now trying to find out how to isolate these pigments.

Hendricks has another big job—as key man of a 10-man group comprising the new Pioneering Research Laboratory for Mineral Nutrition of Plants, at the Agricultural Research Center, Beltsville, Md. This group is doing basic work to find out how nutrient elements like phosphorus, potassium, sulfur, iron, and trace elements pass from the soil into the roots of plants.

This group has already identified the mechanism of metabolic intake of phosphorus by plant roots. The phosphorus concentration inside a plant root is generally higher than in the solution outside the root. Theoretically, this can't happen. But it *does* happen—because a "pump" regulates the movement. The nature of this "pump"—similar to respiratory activity in man—hasn't yet been made clear. This discovery may have far-reaching effects in both plant and human physiology.

Hendricks is enthusiastic about his work—has only praise for the young scientists working with him. Each is capable of working on his own, Hendricks states.

He can't conceive of retiring. "Only if incapacitated or otherwise diverted from research would I consider retiring," he smiled. "I'm a researcher and don't want to be anything else." He feels his work on photoperiodism and nutrient uptake will last a lifetime.

Service gives him freedom, satisfaction

Hendricks earnestly recommends that young scientists consider Government service. He has devoted his life to it, has found in it "all the freedom I could possibly want, and deep and lasting satisfaction."

Dr. and Mrs. Hendricks and their 14-year-old daughter, Martha, live in nearby Silver Spring, Md. Hendricks enjoys gardening, loves to raise azaleas and camellias, and has practically remade his soil. He reads a great deal, mostly scientific literature to keep abreast of his work, and all he can get on mountaineering. Although he no longer climbs mountains—he's still suffering from a serious fall last summer—he relishes reading about the sport. He has a reading proficiency in German, French, and Spanish, and thinks he will study Russian to help him with the translation of Russian technical journals.

He also enjoys music and is fond of solving chess puzzles. At one time he did long-distance swimming, but "that belongs to my younger days," he says. "I'm going to try to stay in one piece to do my work."

Internationally known for his contributions to science, Hendricks remains a devoted public servant. Warm and responsive, he instills confidence by his calm, measured approach. What he and others like him can create for the good of man is limited only by the imagination. ☆

NEW NEMATODE-RESISTANT LIMA BEAN

Variety is descended from lima beans selected by Hopi Indians

EARLY THOROGREEN (center), usually productive, was stunted on root-knot soil where offspring hybrid Nemagreen (each side) did well.

■ THANKS TO THE HOPI Indians and a group of State and USDA scientists, lima-bean growers will have the productive new green-seeded Nemagreen variety of lima beans to grow on root-knot-infested soils in 1958.

Nemagreen's high resistance to root knot originated with the nematode-resistant Hopi lima bean, selected by the Hopi Indians for adaptability to their infested soils in Arizona. The plant breeders combined Hopi's nematode resistance with important characters of some of our best market types. From thousands of offspring of crosses with Hopi lima there ultimately emerged the baby green-seeded line of limas with high resistance to nematodes and high all-round quality and productivity.

The breeding work started 15 years ago. Plant breeders H. B. Cordner, of the Oklahoma Agricultural Experiment Station, P. H. Massey, Jr., of the Virginia station, and R. E. Wester, of the ARS Agricultural Research Center, Beltsville, Md., began collecting root-knot-resistant lines from widely scattered root-knot areas. The resistant Hopi selection 5989 was obtained from W. W. Mackie, of the California Agricultural Experiment Station. The plant breeders crossed this with a number of nonresistant limas possessing the desired horticultural characters. The most promising crosses were exchanged by the three scientists for testing and breeding.

One parent is Indian variety

Crosses of Early Thorogreen variety with the root-knot-resistant lines gave the best results. Nemagreen was developed by crossing Early Thorogreen with the white-seeded Oklahoma 27 variety, which had resistance from its Hopi parent. It took one backcross to early Thorogreen to improve quality and productivity. The best plants from this backcross gave rise to the promising Nemagreen just released to growers.

In field tests from coast to coast in the past 5 years, Nemagreen yielded a little less on root-knot-free soil than certain other baby green-seeded varieties which lack nematode resistance. In 125 trials, Nemagreen averaged 4,420 pounds of marketable pods per acre, and Early Thorogreen and Clark's Bush, 4,608 and 4,761 pounds per acre, respectively.

Crops saved on infested soils

On soils infested with root-knot nematode, however, the story is quite different. For example, a Virginia canner reported that Nemagreen yielded about 2,400 pounds of shelled beans per acre on his nematode-infested soil, whereas the common susceptible variety yielded only 800.

Seed growers first received a limited quantity of Nemagreen seeds in 1956 and had a liberal quantity for further increase and field testing in 1957. Now enough stocks have been built up for commercial growers and gardeners in the nematode areas.

Nemagreen can now be obtained through numerous seed companies. Neither the USDA nor the State experiment stations have seed for sale or other general distribution. ☆

THRIFTY LIMA BEANS in the center picture (the Nemagreen variety), yielded abundantly in this root-knot soil beside our leading commercial variety Early Thorogreen. At right is the nematode-infested root of Early Thorogreen, which is a parent of the new variety. At left is the healthy root of the other parent, showing the Hopi resistance.

CHEMICAL ROUTE TO COTTON HYBRIDS

Spray suppresses pollen development, blocks self-fertilization, and limits pistillate plants to pollen from the desired line

■ A NEW CHEMICAL treatment discovered by USDA and the Texas Agricultural Experiment Station may open the way for producing hybrid cottons and improving yield and quality of this and possibly other crops.

The chemical sprays prevent pollen development in some cottons without harming pistillate parts of the plant. Resulting male-sterile plants can set seeds, but only through pollination by other plants. That's the requisite for practical hybridization.

Hybridizing technique needed

Now we need to work out the best possible techniques for effective and safe treatment and to find desirable combining lines of cotton that will respond to chemical treatment. What we've seen of the high-quality, high-yielding, hand-pollinated hybrid cottons produced by plant breeders shows the importance of perfecting this new plant-breeding tool.

Pollen suppression in cotton was first observed by ARS plant physiologist F. M. Eaton in greenhouse experiments with sodium alpha, beta-dichloroisobutyrate (Science, vol. 126, No. 3284, Dec. 6, 1957, p. 1174). These cooperative studies at College Station, Tex., were followed by field trials at the Citrus Experiment Station, Riverside, Calif. Eaton recently retired from USDA and now is associated with the University of California branch station at Riverside.

Eaton and other cooperating scientists showed in the Riverside tests that it's practical under field conditions to keep cotton from self-pollinating and to control its fertilization by a chosen pollen parent, assuring hybrid seeds.

Leaf-color gene helped test

Eaton used a familiar genetic device to show whether he got hybridization. He planted a cotton with a dominant visible trait—the red-leaf character—to serve as the pollinizer. His male-sterile cottons for seed production had recessive green-leaf genes. All offspring of a red-leaf parent would be "tagged" with red leaves.

At Riverside, 2 American-Egyptian cottons (Amsak and Pima S–1) and 2 upland cottons (Empire and Acala 4–42), all green leafed, were planted between alternating rows of a red-leafed strain. The green-leafed varieties were sprayed with a 1-percent solution of alpha, beta-dichloroisobutyrate about a week before flowering, and their seeds collected and planted in due course. From 62 to 68 percent of the seedlings from three of the sprayed cottons had the telltale red stems and first leaves, proving they were the intended hybrids.

The fourth green-leafed variety, Acala 4–42, was only slightly affected by the spray. This variety produced pollen that not only self-fertilized its own plants but also crossed onto other green-leafed varieties. Eaton thinks that accounts for most of the green-leafed offspring in his plots.

INSECTS will crosspollinate a crop like cotton, but only if the seed row has been deprived of its own pollen and the opportunity of self-fertilization. An experimental spray suppressed pollen in cotton. Researcher F. M. Eaton found a sprayed breeding line interplanted with unsprayed pollinator gave desired cross.

Varietal differences may help

The fact that cottons differ in their response to pollen suppressants may enhance the practical possibilities for field-wide spraying. If a seed breeder used a cotton that was highly susceptible to the chemical as one parent line and an unresponsive cotton for the interplant, he could spray the entire field. One variety would supply the pollen. The other variety—the male-sterile one—would bear hybrid seeds.

Expanded studies are now under way on other cotton varieties, chemicals, and methods of application. More research is needed before we'll know what this discovery means to cotton production economy. ☆

BREAKTHROUGH ON JOHNSONGRASS

■ RECENT RESEARCH CONDUCTED jointly by USDA and the Georgia Agricultural Experiment Station has increased the effectiveness of the important chemical weedkiller dalapon against hard-to-control Johnsongrass.

ARS weed specialist E. W. Hauser and Georgia agronomist J. F. Thompson at Experiment, Ga., found that *cropland* infested with Johnsongrass can be rid of this pest and kept in crop production by advance spraying with the chemical and subsequent disking before planting. This can be more effective and cheaper than tedious cultural control, the present alternative, which may keep the field out of crops and non-remunerative for a season or more.

Corn, cotton, field peas, and peanuts have been grown successfully on badly infested land after chemical treatment and disking. But effectiveness of dalapon against Johnsongrass, and safety of the crop, depend on proper timing of the spraying, disking, and planting.

In these studies, dalapon was evaluated for control of Johnsongrass at several rates of application of the chemical. It was also tried at several time intervals between spraying and disking, and several time intervals between disking and seeding the crop. The most efficient control was obtained when dalapon was applied at 15 pounds per acre, the field was disked 2 weeks later, and the crop planted 1 week after the disking was completed.

Johnsongrass control on *noncrop* land was even more striking. Control was made 95 to 99 percent effective by spraying the grass with 5 pounds of dalapon per acre and repeating that spray 7 to 10 days later. ☆

How Herbicides KILL Weeds

■ SOME HERBICIDES KILL weeds by destroying or interfering with the plants' ability to synthesize needed foods, Federal-State research shows. Some interfere with the first step in photosynthesis—the process by which plants manufacture their own food sources in the green pigments.

Basic studies made by USDA crop researchers in cooperation with the California and North Carolina Agricultural Experiment Stations revealed where the toxic action occurs in the plants.

N-phenylcarbamate, substituted urea, and triazine derivatives all inhibited that portion of photosynthesis concerned with absorption of light by plants and with ultimate synthesis of carbohydrates (sugars and starches) within plants.

Researchers found in one test that killing of barley by the herbicide Simazin (a triazine derivative) can be prevented by supplying carbohydrates to the plants through their leaves.

In other USDA studies at Beltsville, Md., dalapon, a common herbicide, killed plants by preventing formation of pantothentic acid, one of the B vitamins essential to growth of plants.

Studies at Davis, Calif., showed that behavior of herbicides in soils is influenced by such factors as the soil's acid-alkaline balance, clay content, organic matter, moisture content, micro-organisms, nutrient level, physical structure, and cropping practices. Fundamental information thus gained is essential for developing recommendations for soil applications of these weed killers on planted land before the crop has emerged above ground.

Among the substituted-urea herbicides studied, fenuron showed the least residual activity. Monuron showed a little more, diuron showed the most. As a selective herbicide in semiarid and arid climates, monuron should present fewer hazards than diuron—less likelihood of damaging the crop.

Comparison of residual activity on monuron and Simazin showed the latter to have more residual activity in soils. Monuron became inactive in soils more rapidly than Simazin, indicating that the latter chemical may present a problem of accumulated residues in repeated treatments for weed control in certain crops. But the high residual activity of Simazin in soils suggests that it has potential use as a sterilant of soil. ☆

CULTURES ON CALL

MICRO-ORGANISMS are preserved for a short time by simple transfer of culture (top) and for a long time by the lyophilization process (bottom). This calls for freezing, drying, and sealing into airtight tube, which is then stored in refrigerator. Organisms thus prepared stay viable for many years.

THREE METHODS for preserving the viability of micro-organisms are shown at right. Organisms in 3 tubes on left are growing on agar slant; those in 3 center tubes have been lyophilized; those in 3 tubes on right are growing in sterile soil cultures (some fungi can be kept *only* in such cultures). Methods of preservation are chosen depending on characteristics and needs of organisms to be preserved. Lyophilized cultures at far right can be stored indefinitely in refrigerators such as these.

This Laboratory Collects Bacteria and Fungi, Learns To Use Them To Mass-Produce Invaluable Drugs and Other Chemicals From Farm Commodities

■ AGRICULTURE AND INDUSTRY have a unique and indispensable tool in USDA's culture collection of micro-organisms, worth millions of dollars.

Yeasts, molds, and bacteria in this great collection can quickly and cheaply convert agricultural products and byproducts into invaluable vitamins, antibiotics, industrial acids, and many other useful chemicals.

For example, the great efficiency contributed by vitamin B_{12} alone is worth well over $25 million annually to the broiler industry. It's estimated that manufacture of this vitamin, in a recent year, required about a million pounds of corn sugar and distillers' solubles or similar material equivalent to 300,000 bushels of gain. Products from several million bushels of grain are used annually for other items.

Program evolved over the years

The collection dates back officially to 1939 with the establishment of a group of 50 cultures at the ARS Northern Utilization Research and Development Division, Peoria, Ill. But it really grew out of Charles Thom's mold collection in the early 1900's, and the bacteria and molds at the old Color Laboratory at Arlington Farm, near Washington.

Many cultures are kept

The collection has grown to over 8,000 cultures of industrially important yeasts, molds, and bacteria—one of the largest and most important collections in the world. Microbiologist C. W. Hesseltine and associates administer the collection.

Micro-organisms are important to agriculture. Some are harmful, attacking plants and animals. Others transform plants and animals into useful soil chemicals. Some fix nitrogen from the air in the nodules of legume roots. Some ferment and preserve silage. And some convert farm crops to industrial uses in making cheese, yeasts and bakery products, vinegar, pickles, other fermented foods and beverages, and many widely known commercial chemicals.

All penicillin manufactured in this country today is produced from subcultures of the mold *Penicillium*

chrysogenum, an organism isolated at the Northern Laboratory. USDA scientists there developed improved strains of the mold and perfected the medium in which it grows, increasing yield a hundred times and leading to large-scale commercial production.

Present-day manufacture of clinical dextran as a blood-plasma extender is based largely on work done at the Northern Laboratory. Scientists there discovered the micro-organism used to produce clinical dextran—this micro-organism was a strain of the bacterium *Leuconostoc mesenteroides*—and worked out a method for efficient, large-scale production.

Work with the cultures also led to simpler and cheaper ways to produce vitamin B_2 (riboflavin), vitamin B_{12}, and the enzyme fungal amylase.

Process made riboflavin cheap

The Northern Laboratory's development of a method of producing riboflavin by using the yeast *Ashbya gossypii* has made available large quantities of the valuable vitamin at lower prices for poultry and swine feeding. In purified form, riboflavin is also used for medicines and food. The process utilizes agricultural commodities such as animal stick liquor and glucose. This country's annual riboflavin production by all methods totals over $6 million in wholesale value; over half of this output is produced with *Ashbya gossypii*.

Much of our vitamin B_{12} is produced by the bacterium *Streptomyces olivaceus* by a method developed by ARS scientists. And industrially developed methods of producing the vitamin are based on similar organisms. Concentrates of the vitamin are important in supplementing animal feeds—especially for poultry and swine—and result in greatly improved feeding efficiency.

Methods developed for the production of fungal amylase have considerably reduced the costs of producing industrial alcohol. Fungal amyalse, a mold product of *Aspergillis niger*, was a wartime development designed to replace hard-to-get malt. Today, it is used by several companies instead of malt to convert starch to fermentable sugars in the production of alcohol from cereal grains. The number of producers employing this less-expensive method is growing.

Over 2,000 subcultures are supplied annually to government, industry, and university laboratories both here and abroad. About half are for research and control work in agriculture, from production of antibiotics to vitamin assay. Numerous cultures are received from outside laboratories for investigation. Every effort is made to assist others working on agricultural problems, to help industry establish and expand new fermentation processes, and to discover new organisms of important potential use.

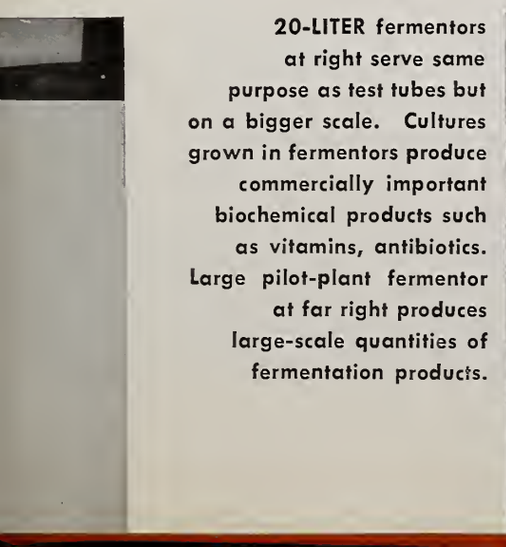
New uses found for corn sugar

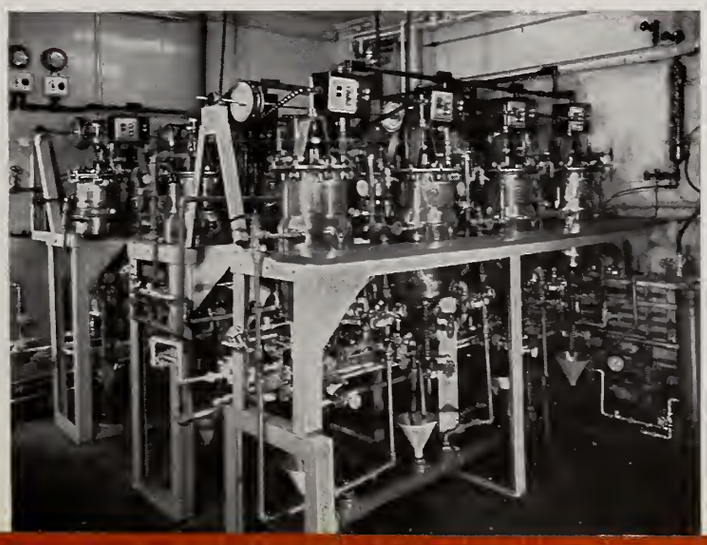
Recently, cultures and processing directions were furnished for a new plant producing an acid used in the food industry. Corn sugar is used to produce this acid. Corn sugar was also utilized in USDA development of a method for manufacturing sodium gluconate as a detergent for cleaning bottles. Several hundred yeast species were supplied to the Army Quartermaster Corps to help find hardier baking yeasts for use in dried form for large-scale baking.

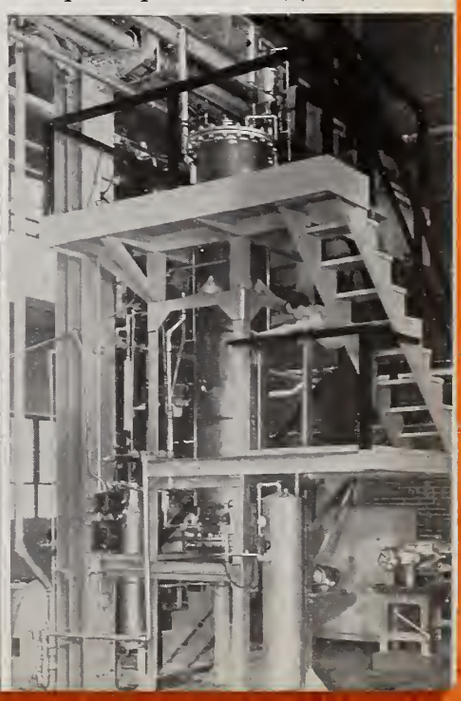
Plant antibiotics are needed

Future research may contribute to the development of antibiotics for plant diseases, which cause annual losses of billions of dollars. Already, streptomycin has been found in other USDA research to be effective against apple and pear fire blight and certain bean blights. And it's possible that an antibiotics industry as large as the one we now have for human therapy may be developed to combat plant disease. In that case, many millions of pounds of agricultural materials would undoubtedly be needed.

Another project underway is a survey of the culture collection to discover if organisms can produce protein containing high percentages of the amino acids lysine, methionine, or tryptophane. If so, millions of bushels of grain would be utilized in producing the protein and amino acids needed to bring the protein quality of farm feeds up to optimum. ☆



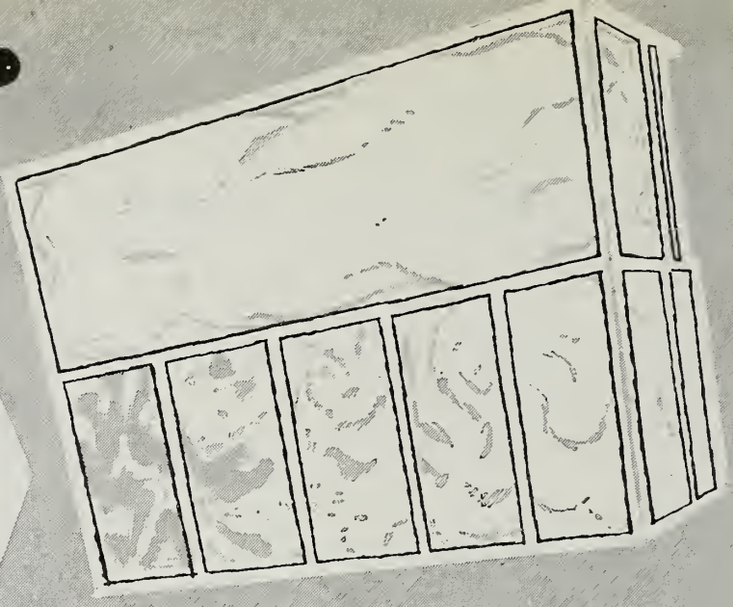




20-LITER fermentors at right serve same purpose as test tubes but on a bigger scale. Cultures grown in fermentors produce commercially important biochemical products such as vitamins, antibiotics. Large pilot-plant fermentor at far right produces large-scale quantities of fermentation products.

New color comparator should help the wool trade and processors determine the proper values in pricing

OFFCOLOR WOOL



COLOR sample (top) is identified with market wools being discounted variously in the market due to off color. The comparator could lead to standards, grades, more uniform pricing.

■ A COLOR COMPARATOR, which has been developed by USDA to judge the value of discolored wool, may prove useful to the Nation's wool producers and processors. The unit may also be used to establish market standards and grades for wool.

The comparator is a small, glass-fronted plastic box containing five wool specimens representative of a cross section of domestic wools. There is also space to place a specimen for judging. This market aid was devised by F. J. Poats, agricultural economist of the Market Development Branch of the Agricultural Marketing Service, and Willie Fong, chemist, ARS Western Utilization Research and Development Division.

Comparisons are made for discolorations caused by urinal and fecal stains, mineral and vegetable stains, and off colors resulting from the actions of bacteria, fungi, contaminants, and heat on wool. Naturally pigmented wools are not considered.

Samples proved representative

To learn whether the comparator is a practical aid in determining value discounts for off colors, Poats showed the unit to 50 firms representing 123 wool processors. These concerns use more than half of the wool processed in the United States. The buyers found that color samples in the box represented offcolor ranges identified in the marketplace with specific descriptive terms.

Woolmen used the term "good territory wool" to describe the lightest color example in the comparator (labeled "A" for a base reference). They described specimen "C" as "creamy Texas wool," or "good color fleece wool;" "E" as darker fleece from the southeastern areas.

All buyers associated off color with lower value and as a source of price discount with a substantial degree of uniformity. Some of them thought off color in wool was an indication of fiber weakness, poor spinning quality, and harsh feel in woolen fabric.

Color "C" was discounted in price from the base color "A" by 3.3 percent for fine wool, 3.5 percent for medium wool, and 3.7 percent for coarser quarter-blood wools. Color "E" was discounted from "A" by 6.9 percent for fine wools, 7.4 percent for medium wools, and 6.8 percent for coarser quarter-blood wools.

Mills that did partial processing tended to discount more than integrated companies that processed greasy or scoured wool into fabrics or garments. Integrated concerns often segregated the colored wools for use where there was no disadvantage.

Color ratings could also reflect demand. Trends to white and pastel shades in wool garments were major reasons for color discounting of wool.

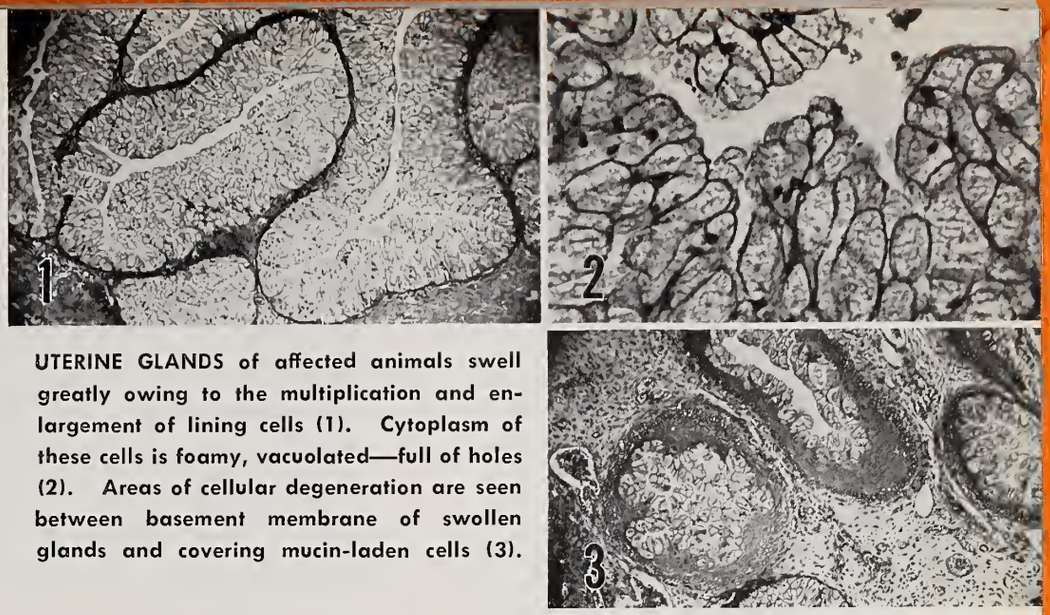
The amount of off color in wool may be reduced in several ways. Offcolor discounts are a guide as to maximum cost justifiable for removing color chemically. Producers also can reduce amount of off color in wool.

Causes of discoloration studied

Research is underway for better breeding and other husbandry practices. Oily fat, perspiration, and grease on wool are most troublesome with ranch and farm flocks. To help prevent staining, proper shelter and bedding could be provided, and wet, sloppy conditions avoided.

The care in handling clipped fleeces prior to shipment may decrease the development of off color in storage. Discoloration, for example, may be greatly reduced if scouring is done soon after the wool is clipped. And storage discoloration will also be reduced by storing fleeces dry and only in well-ventilated areas. ☆

LOOK OUT FOR CONTAMINATED TEST FEEDS



UTERINE GLANDS of affected animals swell greatly owing to the multiplication and enlargement of lining cells (1). Cytoplasm of these cells is foamy, vacuolated—full of holes (2). Areas of cellular degeneration are seen between basement membrane of swollen glands and covering mucin-laden cells (3).

■ LOW FERTILITY AND PERMANENT sterility in laboratory test animals can result from accidental estrogen contamination of pelleted feed by commercial feed producers, say USDA scientists at Plum Island, N. Y. (Plum Island is one of the world's great basic-research centers for the study of foot-and-mouth disease and other foreign diseases that threaten our livestock.)

This serious obstacle to livestock research is a threat to the continuity and even validity of important studies. The correction lies in following contamination-proof methods of preparing feeds for laboratory test animals.

ARS veterinarians H. R. Seibold and J. F. Wright found a puzzling sharp drop in number of pregnancies and births among their test animals. Unweaned female guinea pigs showed uterine discharges and subsequent autopsy showed uteri enlarged and blood vessels swollen.

Microscopic examination revealed that glands in the uterus were greatly swollen through enlargement and multiplication of their lining cells. The cytoplasm of these cells was foamy and full of large holes. In the severe cases, cellular degeneration set in between the membrane of some of the swollen glands and the overlying mucin-laden cells. Granular cells of many egg sacs of the ovaries also showed degeneration.

Researchers soon found why this happened. Check of the pelleted feed showed it was contaminated with estrogen—20 milligrams per kilogram of feed. The feed had been processed in a mill previously used for preparing an estrogen-supplemented broiler mash.

There was no improvement in ability of breeders to reproduce even when contaminated feed was replaced, and the building, cages, feeders, and bulk containers were sterilized. Observation of affected females was continued for 4 months after the feed was changed.

According to the researchers, these results indicate the need for extreme care in handling potent hormone supplements. Unintentional contamination of laboratory animal feed can occur in any feed mill where these powerful substances are stored or used in the manufacture of feeds. Premixing rooms, mixers, elevators, pellet mills, even the ever-present feed-mill dust are *all* potential sources of contamination of test feeds.

Feed stored where these powerful hormone products have been used isn't safe for breeding animals. Some of the larger commercial producers of animal feeds have adopted the policy of manufacturing feeds for laboratory animals in a special mill that isn't used for processing estrogen-supplemented feeds. ☆

How Costly is JOHNE'S DISEASE?

■ SLOW, EASYGOING Johne's disease can cost considerably more than many of our cattlemen think.

We have made a start toward getting reliable figures on this widespread intestinal disorder through a herd study conducted by the USDA Regional Animal Disease Laboratory, Auburn, Ala. Past estimates often involved uncertainty over a herdsman's memory, actual cause of losses, and effects of control efforts.

ARS animal pathologists A. B. Larsen and T. H. Vardaman followed Johne's disease for 12 months in a naturally infected purebred Guernsey herd of 100 adult cows and 67 young stock animals. No attempts were made at control during the period.

Of 18 animals culled during the year, 7 were eliminated because of Johne's disease. That's as many head as were removed for reproductive disorders and more than the total

taken out for all other reasons. The 7 culled animals would have been worth $216.60 a head for dairy use. But they had to be salvaged for a total of $210—a loss of $1,306.20.

Milk was bringing about $25 a head monthly over feed costs. Johne's disease shortened the lactation period about 6 months for the 7 culled animals, causing a milk-production loss that amounted to $1,050.

Furthermore, 15 heifers that normally would have been marketed at the end of the year as breeding stock had to be sold for beef because of the disease condition in the herd. These heifers were valued at only $100 a head for beef—or $116.60 less than their worth for breeding purposes. This was a loss of $1,749.

So the 1-year-bill for Johne's disease ran $4,105.20 in this herd.

Yet, herd owners don't ordinarily get excited about this disease. Usually, it spreads slowly, incubation takes a year or longer, only 1 or 2 animals are sick at a time, and the death losses occur irregularly.

Caused by bacteria known as *Mycobacterium paratuberculosis,* Johne's disease brings on recurrent scouring and unthriftiness. Infected animals waste away and eventually die. Their droppings carry the infective bacillus, which can live outside the body for a year or even longer. An animal may carry these organisms for years without showing signs of infection.

Johne's disease is hard to deal with. We have no satisfactory treatment. Limited measures aid in control—slaughter accompanied by sanitation, and taking calves at birth and raising them on clean ground. Our experimental vaccines cause an animal to react positively to the johnin test and sometimes to the tuberculin test. Consequently, their use interferes with accurate diagnosis of both Johne's disease and tuberculosis. Johne's disease can't be established in samll animals in the laboratory, and the organism is hard to isolate and grow in artificial medium.

Most frustrating of all, we don't have an absolutely dependable test. That's the main goal in our work with the infected herd under study.

Every 3 months, each animal is given the standard johnin test (skin injection of sterilized liquid prepared from a culture of the causative bacteria, producing a swelling in reactors). At the same time, blood samples are taken from each animal for use in efforts to develop a different type of test. Intestinal specimens from animals sent for slaughter are examined microscopically for the germ that causes Johne's disease.

The researchers hope to learn more about its spread and the test-reaction pattern—perhaps even break through on diagnosing this disorder before the clinical signs become evident. ☆

AMINO ACIDS IN OUR FOODS

■ A NEW TOOL FOR WORKERS in the field of amino acid research and for those who must calculate amino acid content of foods is now available. This is Home Economics Research Report No. 4 entitled "Amino Acid Content of Foods." In it M. L. Orr and B. K. Watt of the USDA Institute of Home Economics bring together and summarize data on the 18 amino acids most widely occurring in foods. The values are derived from original articles reported in the scientific literature of this and other countries and from unpublished reports.

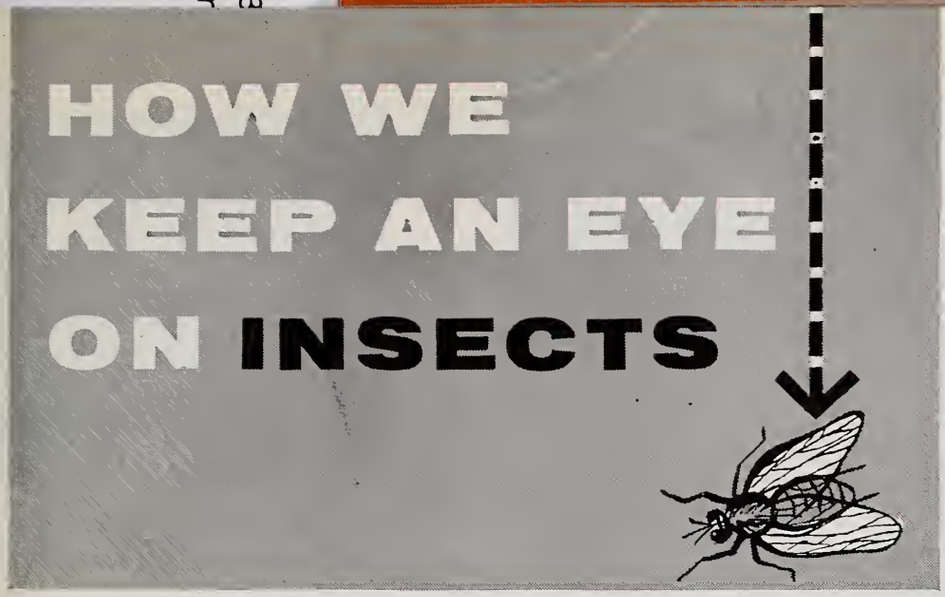
The data are shown in two tables. The first was prepared primarily for research workers. It shows, in addition to average values, the range in admissible values for each amino acid in terms of minimum and maximum found in the literature. This table also shows the number of samples used in deriving the average.

Since different samples of the same kind of food vary in their nitrogen (hence protein) content, all amino-acid data found in the literature were reduced to terms of quantity of amino acid per gram of nitrogen and are shown on this basis in the table. This first table will be useful to those who have nitrogen data for the foods of their interest and to those who want to know the basis for the average amino-acid values.

The other table shows the average amino-acid content for 316 foods and will be useful for dietary calculations, including those for dietary surveys. The data can be used to calculate the amount of each of the 18 amino acids present in ordinary food supplies.

The 373 published sources of data on which the values were derived are listed following the tables.

In addition to uses made of these amino-acid data in this country it is anticipated that the information will be useful to such international organizations as the Food and Agriculture Organization of the United Nations, the World Health Organization, and others having administrative and advisory responsibilities for food and nutrition programs. An earlier preliminary and incomplete draft of the tables was used in 1955 by a special ad hoc committee of FAO established to deal with protein requirements. ☆



Field surveys in all the States are reported through Washington to inform the Nation of changing insect numbers

■ A NATIONWIDE NETWORK of volunteer entomologists track insect activity, just as radar systems spot planes.

Scientists in land-grant colleges, researchers at State and USDA experiment stations, Extension Service specialists, county agricultural agents, employees of State departments of agriculture, and other workers join with ARS to alert the Nation to insect development in each State.

The Entomological Society of America helps guide activities through an advisory committee of public agency and industry representatives. The means of communication: The Cooperative Economic Insect Report.

Through this weekly publication, agriculturists are alerted to possible population growths of such insects as the cotton boll weevil, European corn borer, and the grasshopper. Growers are kept aware of insect buildups that might spread to their areas from neighboring States.

Entomological surveys reported in the publication help industries gear production of insecticides according to potential needs. One section acquaints readers with insects not known to occur in the United States. (The Mediterranean fruit fly, khapra beetle, and the spotted alfalfa aphid came here from abroad.) Art sketches and descriptions help surveyors detect insect invaders.

Information gathered by volunteer entomologists in each State is funneled to clearinghouses, which forward weekly summaries to the Plant Pest Control Division in Washington, D. C. Those summaries vary from 1 paragraph to 8 single-spaced pages.

Some 1,500 condensed statements were received by the Economic Insect Survey section during 1957, an average of 31 per week. In addition to the State summaries, special control program reports arrive from four regional Plant Pest Control offices. They are located in Moorestown, N. J., Gulfport, Miss., Minneapolis, Minn., and Oakland, Calif.

At some times, reports arrive from a few States, at other times, from almost all of them. (The record for 1 week is 45 condensed statements received from States.) During the height of the insect season—April through September—summaries are larger and more frequent. There is less activity from October to March.

State and regional reports from all areas are condensed in Washington for the national weekly report and mailed to 2,800 persons in Federal and State agencies, industries, and various other interested individuals.

This includes information, for example, on the grasshopper, based on the number of grasshoppers found per square yard. Fall surveys indicated heaviest infestations this year will be in Texas, Montana, Arizona, and California. Other infestations are reported from Nebraska, Oklahoma, Idaho, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

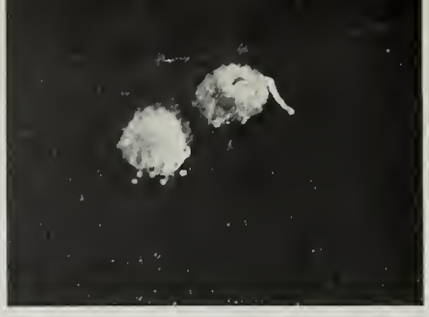
Grasshopper populations reported during the fall of 1957 covered 18,686,492 acres in 17 States, compared to 22,190,280 acres in 19 States the previous year. (Missouri and Arkansas, listed as infested States a year ago, are not among last fall's forecast infestations.) Distribution of the infestations is shown on maps in the report. Final and detailed plans to cope with the situation will be made after the current early spring survey finally has been completed.

Another survey—of the European corn borer—starts during growing season and continues until fall. Potential population for the following year is determined by counting numbers of insects going into hibernation. This gives an indication of the possible need for control. Entomologists also estimate the previous season's losses. Last year, losses totaled $158,841,000, with heaviest damage in Iowa, Nebraska, Missouri, South Dakota, and Illinois.

Information on the potential infestation for the following season is also provided cotton growers after boll-weevil hibernation counts are made in the fall. A spring survey is just getting underway to determine the percentage of survival.

The survey report, which started in 1921 on a monthly basis, was restricted because of lack of funds during World War II. Then, in 1951 the publication was resumed as a weekly for USDA and the Federal Civil Defense Administration with an additional purpose: To guard against possible biological warfare. ☆

③ Chloromycetin treated.



② Amethopterin treated.

① Ovary of untreated fly.

④ Potassium arsenite treated.

HOUSE FLIES CAN BE USEFUL

As "Guinea Pigs," They Speed Up the Testing of Drugs for Anticancer Properties

■ COMMON HOUSE FLIES MAY provide a means for rapid screening of tumor-inhibiting compounds designed for medical treatment of man.

In USDA trials conducted during the past several months at Beltsville, Md., ARS insect physiologist Norman Mitlin and associates found that several anti-cancer compounds inhibit growth of the ovaries in female houseflies. The inhibitory powers can be determined within 3 days if houseflies are used as a test medium.

Houseflies complete a life cycle in slightly more than 2 weeks. They are similar to higher animals and other insects in many of their physiological aspects. With minimum space and effort, 1,000 to 2,000 flies can be reared daily by nonprofessional workers at a low cost for laboratory use. Only 30 to 40 flies are needed for a single test. Mice and rats, normally used in screening tumor-inhibiting materials, require months of effort in breeding new strains and in rearing the animals to maturity. Also involved are the time-consuming tasks of initiating the tests, and awaiting the outcome of slow results.

Mitlin has tested 26 antitumor compounds on flies. Positive results were obtained with 15 of the compounds, including some provided by the Cancer Chemotherapy National Service Center of the National Institutes of Health located at Bethesda, Md.

In actual practice the houseflies are separated by sex upon emergence from the pupal stage. The segregated females are fed milk containing a material to be tested. After 3 days, the flies are dissected, and their ovaries are removed. Underdevelopment of the ovaries indicates inhibiting action by the test material.

The tests that led to these discoveries were aimed at finding a chemical that would cause sterility in insects and keep them under control. ☆

⑤ 1,5-diaminobiuret treated.

⑥ D-L-ethionine treated.

⑦ B-2-thienylalaline treated.

⑧ 4-methyoxytoluquinone treated.

5 MM

Rodenhiser takes key post

Herman A. Rodenhiser succeeds Karl S. Quisenberry as Assistant Administrator for Farm Research in USDA's Agricultural Research Service. Quisenberry retired from Government service January 31.

The new administrator will be assisting in the direction and coordination of USDA research in crop production, soil and water conservation, agricultural engineering, entomology, animal husbandry, animal diseases, and farm economics. He was previously in charge of research on cereal crops and diseases in ARS and directed crop-plant studies to insure the stability of grain production.

Quisenberry has accepted two temporary assignments. He will work with the Rockefeller Foundation as technical adviser on wheat research in Chile, and with the North Carolina Agricultural Experiment Station on small-grain improvement in Chile.

Dust cattle for hornfly

Treating dairy cows with methoxychlor insecticide *as a dust—but not as a spray*—is now recommended by USDA to control the costly hornfly.

This recommendation follows the recent decision of the Food and Drug Administration of the Department of Health, Education, and Welfare that there is no objection to using methoxychlor on dairy cows if the insecticide is applied so that no residue occurs in milk. The agency does not permit methoxychlor residue in milk.

Studies made in Oregon have shown that methoxychlor properly applied as a dust to only the backs of dairy cows will effectively control hornflies without introducing any residue of the insecticide into the milk. ARS researchers recommend applying 1 tablespoon (about 10 grams) of 50-percent methoxychlor powder to each animal, sprinkling it over the back and rubbing it lightly into the hair. This treatment will control hornflies for about 3 weeks, but will not control

lice, the housefly, other biting flies, or ticks infesting the cattle.

ARS *does recommend methoxychlor sprays in the barns*—but not on the animals—to control stable flies and houseflies in the housing area.

Rapid-fire recordkeeping

Computing centers are being established in five States in cooperation with USDA to record and process electronically dairy production data for the Dairy Herd Improvement Association. Locations will be Ithaca, N. Y., Raleigh, N. C., Columbus, Ohio, Ames, Iowa, Stillwater, Okla.

DHIA (Agr. Res., Sept. 1956, p. 3) provides dairy farmers with milk production records for use in (1) culling low-producing cows, (2) feeding according to each cow's production, and (3) selecting the best animals to raise herd replacements.

The new system will provide more detailed information, and faster than heretofore. And cost will be low—less than 10 cents per cow per month. The electronic procedure has been developed cooperatively by ARS and Cornell University, in Ithaca.

Reports for DHIA supervisors, based on once-a-month visits to dairy farms, will be mailed to the nearest computing center. Information will be analyzed rapidly by machine for immediate use by dairymen. Monthly milk and butterfat production for each cow will then be calculated.

The records will also include, on a lactation basis: Butterfat test, days in milk, days milked three times daily, days carried calf, days previous dry period, value of product, amount of feed fed, feed index (ratio of feed fed to feed need), feed costs, and income over feed cost.

Lactation records of each cow will be kept until the cow leaves the herd or freshens again. Records of all daughters of a sire will be available for evaluating. And herd records will be assembled for dairymen's information. This will enable ARS to call attention to sires that transmit high milk production.

The system has been in operation in 10 Northeastern States the past year. Computations for this area were made electronically in Ithaca.

Co-ops must watch credit

As production technology increases farmers' cash costs, credit policies become more troublesome to farm-supply cooperatives. USDA's Farmer Cooperative Service studied above-average credit operations in eight co-ops to learn what credit-control policies to recommend. The co-op study was made in Michigan, Indiana, Ohio, and Pennsylvania.

Control and collection of charge sales have become more difficult as a result of the increasing credit extended by co-ops. And farm incomes are declining, restricting the cash for increased production expenses.

To improve credit operations, FCS suggests that cooperatives: (1) Establish realistic policies by board of directors; (2) adopt specific programs for extending credit; (3) establish

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sound collection procedures and followthrough; (4) recognize and allocate costs of credits; (5) encourage and assist farmers to use existing credit agencies.

Average volume of the 8 cooperatives for the fiscal year 1956 was about $1⅓ million. Feed accounted for 30 percent. Proportion of feed bought rather than home grown is increasing. And advances in animal nutrition encourage purchasing antibiotics and growth regulators.

Petroleum products averaged 27 percent of the annual volume. Fertilizer accounted for 15 percent; building materials, 9 percent; farm machinery, 6 percent; seed, 5 percent; and general farm supplies accounted for the remaining 8 percent of total.

Watch for tiny flower

Farmers in corn-producing areas should be on the lookout for tiny red, yellow, or almost white flowers of the witchweed in May and until the next frost, USDA officials say.

Seeds ripen after flowering from June until frost. After germination, witchweed roots penetrate the roots of corn, sugarcane, sorghum, some grasses, sedges, and broadleaved plants, robbing them of food and water. Stunting, wilting, and yellowing occur, resembling symptoms of drought. The parasitic plant has been found in 17 counties in the States of North and South Carolina, where a Federal quarantine is now in effect under ARS. Intrastate movements are regulated by State quarantines.

Since one plant produces as many as half a million microscopic seeds, pest-control officials are anxious to find every patch of the pest. Farmers can help by reporting all suspicious plants to the control officials, county agents, or State experiment station for positive identification. The plants or seeds should not be moved from the field until identity is established, since the minute seeds can be spread easily.

New jelly-making method

A continuous new method of making jelly with fruit-juice concentrates instead of single-strength juices turns out better jelly more economically, according to USDA researchers. Concentrates are natural juices from which some water has been removed.

ARS scientists at the Western Utilization Research and Development Division, Albany, Calif., developed the method in their continuing efforts to find uses for concentrates. Availability of good concentrates is the key to commercial use of the method.

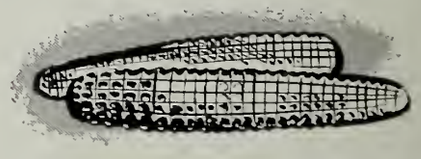
To make the new-type jelly, measured amounts of cold fruit-juice concentrate, cold pectin, and hot sugar sirup are brought together in a mixing pipe. One portion of the pipe is steam-jacketed to bring the temperature of the concentrated mixture to 180° F. for filling into glasses. The jelly is colorful, flavorful, undamaged by long cooking. The traditional batch method calls for cooking single-strength juice with sugar and other ingredients until enough water is evaporated to make jelly.

Feeding corncobs

Chaffy and woody portions of corncobs are about equal to ground whole corncobs for use in beef steers' wintering rations, USDA reports. Corncobs—like other good-quality roughages—have about three-fifths the feeding value of shelled corn.

Feeding of corncob fractions, by-products from several cob-using industries, was studied by the Nebraska Agricultural Experiment Station. The work was done under contract for the ARS Northern Utilization Research and Development Division, Peoria, Ill.

Yearling steers gained nearly as well when cob chaff and woody cob



portions were included in balanced winter rations as when ground whole cobs were used. Enough supplementary protein (from alfalfa, soybean oil meal, or other sources), plus minerals and vitamin A or carotene, must be included in cob rations. This is true whether the rations fed to the animals are high or low in corn.

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